**Atoms + Subatomic Particles**

***Nucleus:***

**Protons (+)** – Determine the atom’s **identity**; **atomic #** (by which they are arranged on the Periodic Table)

**Neutrons (=)** – (rounded) Atomic Mass - Atomic Number

***Orbiting the Nucleus:***

**Electrons (-)** – Same as protons in a **neutral** atom

**Periodic Table**

Elements – building blocks of matter; cannot be broken down into simpler substances

Arranged by the number of protons in the nucleus and there are many patterns that allow us to make predictions about an atom’s properties based on where it is on the periodic table including:

* Vertical columns (groups/families) have similar properties
  + Alkali Metals (Group 1) are extremely reactive losing 1 electron in bonding
  + Halogens (Group 17 or 7A) are all diatomic non-metals and gain 1 electron in bonding
  + Noble Gases (Group 18 or 8A) are **unreactive** gases
* Reactivity decreases as you move from left to right with the least reactive group (noble gases) on the far right.
* Metallic characteristic decreases as you move from left to right.  **Metalloids** (along the stair-step line) have properties of both metals and nonmetals. Silicon (14) is particularly useful to us as a semiconductor in computer chips.

**Classifying Matter**

***Pure Substances:***

**Elements** are the simplest form of matter and are found on the periodic table. Each element has its own unique atom.

Ex: aluminum, gold, anything on the periodic table

**Compounds** are 2 or more elements bonded together chemically in a set ratio. Each compound has its own unique **molecule**. Compounds do NOT have the same properties as the elements from which they are made and they CANNOT be separated.

Ex: water (H20), salt (NaCl), sugar (C6H12O6)

***Mixtures:***

Mixtures are substances that are physically combined in the same space but they are NOT chemically bonded and can therefore be easily separated. The individual parts of the mixture keep the properties of the substances that make them up.

**Homogeneous Mixtures** are uniformly combined and therefore the entire mixture looks the same. Many of these are solutions (where one substance is dissolved into another). Evaporation can be used to easily separate a (usually) solid in solution from a liquid.

Ex: salt water, tea, koolaid, soda

**Heterogeneous Mixtures** have unevenly distributed parts that can easily be seen.

Ex: salad, granite, pizza

**Properties & Changes**

***Physical properties*** can be observed without changing the chemical makeup of the substance.

Ex:

**Metals** conduct energy, are shiny, are **malleable**, are dense, and are mostly solid at room temperature.

**Non-metals** are dull, less dense, brittle & mostly gases at room temperature.

***Chemical Properties*** canonly be observed when the substance is being changed into a **different** substance (through chemical change).

Ex: reactivity & flammability

***Physical Changes*** atoms/molecules stay the **same**

Ex: change of shape or **state,** one substance dissolving in another

***Chemical Changes*** (i.e. CHEMICAL REACTIONS) atoms/molecules change into a completely **different** substance

Ex: rust, fire

Evidence/Indicators that a chemical change has occurred:

* Gas production
* Formation of a Precipitate (solid formed from the reaction of 2 liquids)
* Heat production
* Color change

The **Law of Conservation of Matter** states that what goes into a reaction (reactants) comes out (products). This applies to mass or atoms which have mass. A balanced chemical formula reflects this.